

REMARKS

Claims 1-16, 18-20, 24, 26 and 27 have been amended. Claim 25 has been canceled. New claims 34-37 have been added. Thus, claims 1-24 and 26-37 are presented for examination. Support for the amendment to claims 1 and 27 may be found in the specification at page 1, third paragraph. Support for new claims 34-36 may be found in the specification at page 4, last paragraph to page 5, third paragraph. Support for new claim 37 may be found in the specification at the paragraph bridging pages 4 and 5, and in claims 1, 3 and 4. Thus, the present amendments do not add new matter and their entry is respectfully requested. Reconsideration and withdrawal of the present objection and rejections in view of the remarks presented herein are respectfully requested.

Objection to abstract

The Examiner objected to the abstract based on recitation of legal phrasology (i.e. "means"). Enclosed herewith is a revised abstract which no longer contains legal phraseology.

Thus, reconsideration and withdrawal of the objection to the abstract is respectfully requested.

Objection to specification

The Examiner objected to the specification, alleging that its arrangement did not comply with PCT Administrative Instruction Section 204 (MPEP §1823). The specification as amended now includes the headings set forth in PCT Administrative Instruction Section 204.

Thus, reconsideration and withdrawal of the objection to the specification is respectfully requested.

Rejections under 35 U.S.C. §112, second paragraph

Claims 1-33 were rejected as allegedly being indefinite.

In claim 1, the Office Action states that the recitation of "the clutch torque limit value" in lines 4-5, and "the predetermined value" in lines 6-7, do not have sufficient antecedent basis. Lines 4-5 as amended recite "a clutch torque limit value," and lines 6-7 as amended recite "a predetermined value." Since use of "a" indicates that these terms have been introduced for the first time in the claim, no antecedent basis is required.

Regarding Claims 3, 6, 8, and 13, the Office Action states that recitation of "the new gear ratio" does not have sufficient antecedent basis. Claims 3, 6, 8, and 13 as amended recite "a new

gear ratio.” Thus, since this term is being introduced for the first time in these claims, no antecedent basis is required.

Regarding claim 15, the Office Action states that recitation of “the condition” does not have sufficient antecedent basis. Claim 15 as amended recite “a condition.” Thus, since this term is being introduced for the first time in these claims, no antecedent basis is required.

Regarding claim 16, the Office Action states that recitation of “a known relationship between the gear ratios” is unclear. One of ordinary skill in the art, upon reading the present specification, will realize that the control system uses knowledge of the gear ratios to control the amount of torque in the transmission system. One explicit example of the type of relationship that might be used, which is a linear relationship wherein the measured deformation values are adjusted by a scaling factor (subject matter of claim 17), has been provided. Other relationships may also be applicable. For example, in some transmission systems, non-linear relationships may be applicable. Since a known relationship is advantageous to obtain the effect of adapting the amount of torque due to the gear being selected, and based on the specific example provided, one of ordinary skill in the art would be able to adapt this knowledge to account for other situations wherein non-linear relationships are applicable. Thus, recitation of this term is not indefinite.

Regarding claim 18, the Office Action states that recitation of “the rate of change of torque” does not have sufficient antecedent basis. Claim 18 as amended recites “a rate of change of torque.” Thus, since this term is being introduced for the first time in these claims, no antecedent basis is required.

Regarding claim 20, the Office Action states that it is unclear whether “a drive source” is different from the one recited on line 3 of claim 1. Claim 20 as amended recites “the drive source”. Thus, it is clear that the intended drive source is the one recited on line 3 of claim 1.

Regarding claim 24, the Office Action states that it is unclear if recitation of “means for estimating the torque in the transmission” refers to the one first recited on lines 1-2 of claim 24. Claim 24 as amended no longer recites the second occurrence of “means.”

Regarding claim 26, the Office Action states that recitation of “the condition” does not have sufficient antecedent basis. Claim 26 as amended recites “a condition.” Thus, since this term is being introduced for the first time in these claims, no antecedent basis is required.

Regarding claim 27, the Office Action states that it is unclear if: (1) recitation of “a drive source” is different from the one first recited on line 1 of claim 27, and (2) recitation of “a second gear ratio” is different from the one first recited on lines 6-7. Claim 27 as amended recites “the drive source” and “the second gear ratio.” Thus, it is clear that these terms refer to the same terms recited earlier in claim 27.

In view of the comments presented above, Applicant respectfully requests reconsideration and withdrawal of the rejections under 35 U.S.C. § 112, second paragraph.

Rejection under 35 U.S.C. § 102(b)

Claims 1-15 and 26-33 were rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by Schmitz (US 6,061,619).

Claim 1 as amended recites that:

(1) The control system is arranged to automatically adjust a clutch torque limit value before the selector assembly selects an unengaged gear ratio when shifting between gear ratios, to allow relative rotational movement between input and output sides and the clutch device if the torque exceeds a predetermined value when the unengaged gear ratio is engaged by the selector assembly; and

(2) the transmission system is arranged such that the selection of a new gear ratio takes place almost instantaneously without substantial power interruption.

Claim 1 as amended relates to an instantaneous transmission systems that includes a control system that is arranged to adjust a clutch device to a condition that allows relative rotational movement between the input and the output sides of the clutch (slip to occur) prior to engaging a new gear element, while still transmitting torque when a new gear is selected. Claim 27 relates to a method for changing gear in a transmission system instantaneously.

When a new gear is selected in the transmission system, there is a significant torque spike generated because the shift takes place instantaneously under power (see specification at page 1). The torque spike is so significant that it can be heard and felt by the occupants of a vehicle and as such, without means to mitigate the effect of the torque spikes, transmission systems of the type described would fail noise, vibration and harshness (NVH) standards and thus be unusable in

road vehicles. The torque spikes are very large because of the difference in relative rotational speeds between the currently engaged gear and the newly selected gear and also the load applied by the engine and inertia of the vehicle. When selecting a new gear, loads as high as 60 kN can be generated. Without some kind of damping/absorbing system, not only would the transmission system described fail NVH standards, but also in the long-term there would be significant wear on the selector assembly and the gear wheels, which ultimately can lead to failure of the transmission system in an unacceptably short period of time.

In some embodiments, the claimed invention keeps the clutch closed when shifting between gear ratios but reduces the pressure between the input and output sides of the clutch to allow relative rotational movement (slip) to take place when the new gear is selected. This absorbs any torque spikes generated. Subsequently the full clutch pressure is restored. Thus, the claimed invention enables instantaneous shifts to take place without substantial power interruption, while at the same time mitigating the effects of torque spikes that are generated.

In contrast, Schmitz discloses that the clutch is fully opened in response to actuation of a gear shift member (see column 2, lines 46-47; column 2, lines 60-63; column 3, lines 42 and 43; column 3, lines 57 and 58 and column 4, lines 31 and 32). This differs from the claimed invention, in which the clutch is closed to be able to transmit torque to allow relative rotational movement/slip when the torque exceeds a predetermined value when the unengaged gear ratio is engaged. Schmitz does not transmit torque when the new gear is selected because the clutch is fully disengaged.

In addition, Schmitz discloses a "manually shiftable transmission" (see column 2, lines 46-47; and column 2, lines 60-63). There is no disclosure of an instantaneous transmission system as recited in present claim 1, which enables a new gear to be selected while the current gear is still engaged, and since the clutch is opened prior to a shift there is a significant interruption of power when shifting between gears. In Schmitz, when the RPM of the transmission system (RPM_{transm}) is less than or matches the $EngineRPM_{max}$ the transmission 33 is synchronised and the clutch 32 is reengaged (see column 4, lines 51-53) and a conventional shift takes place. However if RPM_{transm} exceeds the threshold value, a "faulty shift" is determined (see column 4, line 61 to column 5 line 6; and column 5 line 35 to column 6, line 11) and the clutch is only partially reengaged, that is, it is moved to an intermediate condition between the fully

engaged and fully disengaged conditions in which the clutch is capable of transmitting torque with a maximum slip.

Thus the clutch of Schmitz is initially fully opened when the new gear is selected, and thus there is no transmission of torque and no relative rotational movement (slip) of the input and output sides of the clutch takes place when the new gear is selected. The slip condition only occurs when closing the clutch after the new gear has been engaged. This allows balancing of the engine speed and the transmission speed (see column 5, line 41 to column 6, line 11). Thus Schmitz relates to a different type of transmission system than the claimed invention, and accomplishes gear selection differently than the claimed invention. Thus, claim 1 is not anticipated by Schmitz. Since claims 2-24 depend either directly or indirectly on Schmitz, these claims are also not anticipated by this reference. For the same reasons discussed above, method claim 27 is also not anticipated by Schmitz.

New claim 37 is also not anticipated by Schmitz. This claim recites structural features of the transmission system that enable instantaneous shifts to take place, namely a selector assembly having first and second sets of engagement elements that are movable into and out of engagement with the first and second gear wheel, wherein when a driving force is transmitted one of the first and second sets of engagement members drivingly engages an engaged gear wheel and the other set of engagement members is then in an unloaded condition, wherein the actuator assembly is arranged to move the unloaded set of engagement members to effect a gear change. Furthermore, the control system is arranged to automatically reduce the clutch torque limit until the input and output sides of the clutch slip before the selector assembly selects an unengaged gear ratio such that further slipping occurs if the torque exceeds the clutch torque limit value when the unengaged gear ratio is engaged by the selector assembly. Schmitz does not teach this method since the clutch is fully opened when engaging a new gear.

In view of the comments presented above, Applicants respectfully request reconsideration and withdrawal of the rejection under 35 U.S.C. § 102(b).

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Rejection under 35 U.S.C. 103(a)

Claims 16-24 were rejected under 35 U.S.C. 103(a) as being unpatentable over Schmitz et al. (US 6,061,619) in view of De Schepper et al. (US 5,767,420). De Schepper et al. does not cure the deficiencies of Schmitz set forth above.

The system of De Schepper et al. is applied to conventional (non-instantaneous) automatic transmission systems (see column 5, line 35, and Figure 10). Conventional automatic transmission systems are not arranged to select new gear ratios almost instantaneously without substantial power interruption as recited in the present claims. The claimed instantaneous transmission system selects a new gear ratio while the current gear ratio is still engaged. Automatic transmission systems cannot do this.

In addition, neither De Schepper, nor any of the other noted prior art made of record and not relied upon, recognizes the problem associated with torque spikes when shifting between gear ratios in instantaneous transmission systems. Furthermore, in order to mitigate this problem the control system controls the torque in the transmission system according to the amount of deformation measured in a static component, which contrasts with the rotary arrangement in De Schepper, and a known relationship between the gear ratios. Using a known relationship between the gear ratios enables the control system to produce smoother gear changes without having to calculate the absolute value of torque in the transmission system. This is not disclosed in any of the cited references. Furthermore, measuring deformation in a static component increases the reliability of the measurements since pickup sensors can easily become soiled during use, which can affect the readings.

De Schepper et al. does not disclose adjusting torque in a transmission based on the known relationship between the gear ratios as recited in the present claims, and therefore does not disclose adjusting the measured values by a scaling factor. Using a known relationship between the gear ratios enables the control system to produce smoother gear changes without having to calculate the absolute value of torque in the transmission system. This provides a better control system, which is an unexpected advantage that could not have been predicted based upon De Schepper. Thus, claims 16-24 are not obvious over this combination of references.

In view of the comments presented above, Applicant respectfully requests reconsideration and withdrawal of the rejection under 35 U.S.C. § 103(a).

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New claim

New claim 37 further differs from Schmitz in that the pressure between the input and the output sides of the clutch is reduced to the slip condition prior to engagement of the new gear. This provides a useful way of detecting that the pressure between the input and output sides of the clutch has been reduced sufficiently to enable further relative rotation (slip) to take place when the new gear is engaged. This is neither disclosed nor suggested by Schmitz or De Schepper et al., either alone or in combination.

Objection under 37 C.F.R. §1.75

Claim 25 was objected to under 37 C.F.R. §1.75 as being a substantial duplicate of claim 14. Claim 25 has been cancelled, thus rendering this objection moot.

Objection under 37 C.F.R. §1.78(b)

Claims 16-24 were objected to under 37 C.F.R. §1.78(b) as allegedly conflicting with claims 1-21 of commonly owned, copending Application No. 10/563,514, and requested that the conflicting claims from one of these cases be deleted, or that a clear line of demarcations be maintained between the applications.. Applicant notes that claims 19-21 of Application No. 10/563,514 were cancelled in an amendment filed on December 2, 2008. Thus, the allegedly conflicting claims are 1-18, rather than 1-21. Present claim 1 recites the “control system being constructed and arranged to automatically adjust a clutch torque limit value before the selector assembly selects an unengaged gear ratio when shifting between gear ratios, to allow relative rotational movement between input and output sides of the clutch device if the torque exceeds a predetermined value.” Claims 16-24 depend on claim 1. In contrast, claims 1-18 of the conflicting application do not recite these features. Thus, there is a clear line of demarcation between present claims 16-24 and claims 1-18 of the conflicting application. Thus, reconsideration and withdrawal of the objection under 37 C.F.R. §1.78(b) are respectfully requested.

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CONCLUSION

In view of the foregoing, Applicant submits that all claims are in condition for allowance. However, if minor matters remain, the Examiner is invited to contact the undersigned at the telephone number provided below. Please charge any additional fees, including any fees for additional extension of time, or credit overpayment to Deposit Account No. 11-1410.

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Respectfully submitted,

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